

AMENDMENTS TO THE CLAIMS~~{Claim 1}~~

1. (Currently Amended) An optical encoder comprising:
an incoherent light source;
a first grating, which is ~~composed of~~ an amplitude grating having a first grating period, for spatial amplitude modulation of the incoherent light from the light source;
a second grating, which is ~~composed of~~ a phase grating having a second grating period, for spatial phase modulation of light from the first grating;
a third grating, which is ~~composed of~~ an amplitude grating having a third grating period, for spatial amplitude modulation of light from the second grating; and
a ~~light-receiving detecting~~ element for ~~receiving detecting~~ light ~~of from~~ the third grating, wherein the encoder detects ~~a~~ relative displacement between ~~the~~ respective gratings.

~~{Claim 2}~~

2. (Currently Amended) The optical encoder according to Claim 1, wherein the second grating is ~~composed of~~ a transparent phase grating having an indented shape with ridges and valleys and a duty ratio of substantially 50%, in which optical path difference between ~~the a ridge and the a valley thereof~~ of the second grating is substantially equal to $\lambda/2$, where λ is wavelength of light.

~~{Claim 3}~~

3. (Currently Amended) The optical encoder according to Claim 1, wherein the second grating is ~~composed of~~ a transparent phase grating having an indented shape with ridges and valleys and a duty ratio of substantially 50%, in which optical path difference between ~~the a ridge and the a valley thereof~~ of the second grating is substantially equal to $\lambda/4$, where λ is wavelength of light.

~~{Claim 4}~~

4. (Currently Amended) The optical encoder according to Claim 1, wherein the second grating is ~~composed of~~ a reflective phase grating, and the first and third gratings are arranged on the same side with respect to the second grating.

~~{Claim 5}~~

5. (Currently Amended) The optical encoder according to Claim 4, wherein the second grating has an indented shape with ridges and valleys and a duty ratio of substantially 50%, in which optical path difference between ~~the a~~ ridge and ~~the a~~ valley ~~thereof~~ of the second grating is substantially equal to $\lambda/4$, where λ is wavelength of light.

~~{Claim 6}~~

6. (Currently Amended)) The optical encoder according to Claim 4, wherein the second grating has an indented shape with ridges and valleys and a duty ratio of substantially 50%, in which optical path difference between ~~the a~~ ridge and ~~the a~~ valley ~~thereof~~ of the second grating is substantially equal to $\lambda/8$, where λ is wavelength of light.

~~{Claim 7}~~

7. (Currently Amended) The optical encoder according to Claim 1, wherein the first, ~~the second,~~ and ~~the third~~ gratings have ~~the a same~~ period P , and both a first distance between the first and ~~the second~~ gratings and a second distance between the second and ~~the third~~ gratings are ~~designed~~ substantially to an odd integral integer multiple of $P^2/(4\lambda)$, where λ is wavelength of light.

~~{Claim 8}~~

8. (Currently Amended) The optical encoder according to Claim 1, wherein the second grating has a period P , ~~and~~

the first and ~~the~~ third gratings have ~~the same~~ a period $2P$, and
both a first distance between the first and ~~the~~ second gratings and a second distance between the second and ~~the~~ third gratings are ~~designed to~~ substantially odd ~~integral multiple~~ integer multiples of $P^2/(4\lambda)$, where λ is wavelength of light.

~~{Claim-9}~~

9. (Currently Amended) The optical encoder according to Claim 1, wherein the second grating is ~~composed of~~ a phase grating in which optical path difference varies sinusoidally.

~~{Claim-10}~~

10. (Currently Amended) The optical encoder according to Claim 1, wherein a first distance between the first and ~~the~~ second gratings is different from a second distance between the second and ~~the~~ third gratings, and
the ratio of the first distance to the second distance is substantially equal to the ratio of ~~at the first grating~~ the first grating period of the first grating to ~~at the third grating~~ the third grating period of the third grating.

~~{Claim-11}~~

11. (Currently Amended) The optical encoder according to Claim 1, wherein the first, ~~the~~ second, and ~~the~~ third gratings have rotary scales ~~of rotary type~~.

~~{Claim-12}~~

12. (Currently Amended) The optical encoder according to Claim 1, wherein the first grating has a spatial distribution of transmittance ~~varying~~ that varies sinusoidally.

~~{Claim-13}~~

13. (Currently Amended) The optical encoder according to Claim 1, ~~wherein~~ including a plurality of the light-receiving detecting elements-are arranged discretely ~~with~~ at the third grating period, and the third grating and the light-receiving detecting elements are integrated with each other.